MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

DSA5541 – DATA STRUCTURE AND ALGORITHMS

(DIT Group)

10 AUGUST 2022
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT:

1. This question paper consists of **SIX (6)** pages excluding the cover page. There are **TWO (2)** sections in this booklet.

2. **SECTION A**: Answer all questions in the answer booklet provided.

3. **SECTION B**: There are **THREE (3)** questions in this section. Answer all questions in the answer booklet provided.

SECTION A (10 Marks)

Instruction: *Write your answers in the answer booklet provided.*

1. Which of the following statements is FALSE for abstract data type?

   A. Declaration of data.
   B. Data to be stored and organized.
   C. Declaration of operation.
   D. Encapsulation of data and operations.

2. Which of the following statements is TRUE for *for loop* statement?

   A. Initialization is executed and executed more than once.
   B. Condition is checked. If it is true the loop ends, otherwise the loop continues and the statement is skipped.
   C. Statement is executed. As usual, it can be either a single statement or a block enclosed in braces { }.
   D. Whatever is specified in the increased field is executed and the loop gets back to step 1.

Figure 1

```
class animal
{
  animal(float,float);
  animal(float,float,float);
}
```

3. What is the special functions in the class animal in the figure 1?

   A. Constructor.
   B. Destructor.
   C. Overloaded destructor.
   D. Overloaded constructor.

4. What is dereference operator?

   A. A pointer can directly access the value stored in the variable to which it points.
   B. The address that locates a variable within memory to that variable.
   C. A pointer that can directly refer to the value that it points to.
   D. Declaring pointers that the user may want to explicitly specify which variable to point to.

Continued.....

5. Which of the following statements is NOT an advantage of Dynamic Memory Allocation?

   A. To use the concept of structures and linked lists in programming.
   B. Created lists insertions and deletions can be done very easily just by the manipulation of addresses.
   C. To use your memory space more efficiently.
   D. Memory should be freed so that the memory becomes available again for other requests.

Figure 2

```
ADTstack()
{
      topstack = -1;
}
```

6. What is the operation for the constructor in the class ADTstack provided in the figure 2 above?

   A. To determine whether the stack is empty or not.
   B. To determine whether the stack is full or not.
   C. To create an empty stack.
   D. To find the size of the stack.

7. Which of the following statements is FALSE for Linked List?

   A. A linked list is represented by a pointer to the first node of the linked list.
   B. The first node is called the back of the list.
   C. If the linked list is empty, then the value of the head points to NULL.
   D. Each node in a list consists of at least two parts; data and reference.

Figure 3

```
int empty()
{
     if(front == .....(i).....)
        return 1;
     else
        return 0;
}
```

Continued.....

8. The function in the figure 3 is to check an empty linked queue. What can be filled up in section (i)?

A. NULL
B. head
C. num
D. data

9. In binary search, there are three variables needed in finding the middle of the list:
i. one to identify the beginning of the list => first.
ii. one to identify the middle of the list => mid.
iii. one to identify the middle of the list =< mid.
iv. one to identify the end of the list. => last.

A. i, ii, iii.
B. i, iii, iv.
C. i, ii, iv.
D. ii, iii, iv.

10. In hashing, collisions happened when two different keys result in the same index by the hashing function. Which of these are the collision resolutions with open addressing?
i. Linear Probing
ii. Chaining
iii. Clustering
iv. Quadratic Probing

A. i, ii, iv.
B. i, iii, iii.
C. i, iii, iv.
D. ii, iii, iv.

Continued.....

SECTION B (30 Marks)

Instruction: *Write your answers in the answer booklet provided.*

QUESTION 1 (10 Marks)

a. Convert and evaluate the following expression. Given an integer $x=7$, $y=4$, $z=2$ and $m=5$. [4 marks]

i. x y z m * + - x z - *

ii. m z x * - 5 y y 2 / + - -

b. Write a ***for..loop*** statement to create a linked list of **3** nodes. Given below in the figure 4 is a ***struct node*** as a reference. [**Hint:** The new node *next* always pointing to the previous node]. [4 marks]

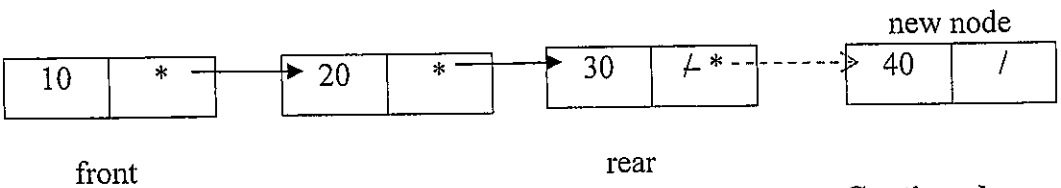
Figure 4

```
#include<iostream.h>
struct node
{
     int data;
     node *next;
};
int main()
{
     node *head, *temp;
     int i,x;
     head = new node;
     cout<<"data ";
     cin>>x;
     .....
     .....
     .....
}
```

c. Write a code to insert a new node to the linked queue given below. Given below in the figure 5 is a declaration of the structure node. [2 marks]

Figure 5

```
struct node
{
   int data;
   node *next;
}front, rear;
```



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QUESTION 2 (10 Marks)

a. By using binary search, show the step in searching the data **55** in the list given. Show all the steps to depict the process. [6 marks]

24, 6, 72, 35, 100, 55

b. The key 62814445 is to be stored in a hash table. Use the folding method to determine the index location of the hash table based on the steps given. [3 marks]

Step 1: Break the key into 3 sub-groups.
Step 2: Add the first 2 groups and minus the last group.
Step 3: Truncate the first 2 digits.

c. Write a hash function to truncate the last 3 digits and the first 2 digits of a given key 7789645285. [1 mark]

Continued.....

QUESTION 3 (10 Marks)

a. Given an array contains the elements shown in the diagram below. By using **Insertion Sort,** sort the following sequence of number in **ascending order.** Draw the sequence of diagram to depict the process and write the number of interchanges required to sort the data. [2.5 marks]

67	23	41	55	13	100	89

b. Draw a binary tree for the algebraic expression shown below: [4 marks]

[[3 + X] * [2 + C / D]] / [3 * 2 – X]

c. Derive the adjacency matrix from the graph given in the figure 6 below. [3.5 marks]

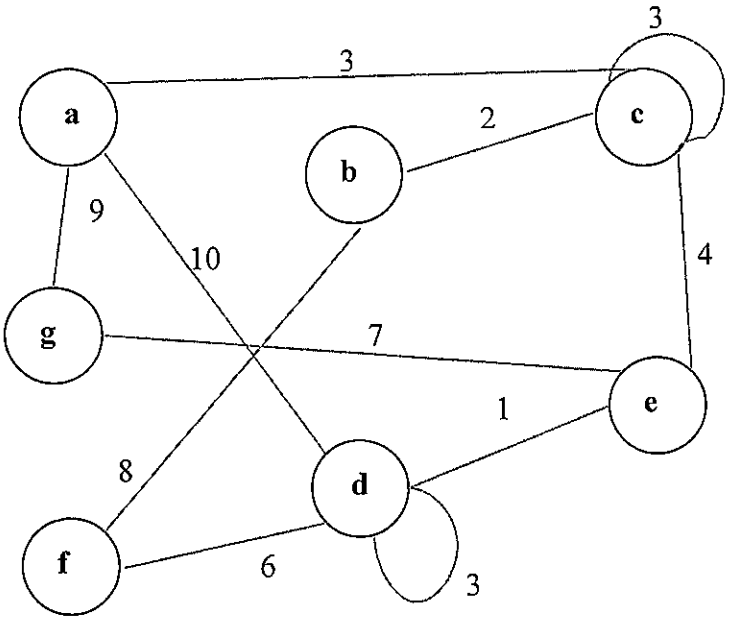

Figure 6

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